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NEWFOUNDLAND SECTION

# "BAIE VERTE '89"

**FIELD GUIDE AND ROAD LOG**

**for the**

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**FALL MEETING**

# 8. GEOLOGICAL SETTING OF SULPHIDE MINERALIZATION AT TILT COVE, BETTS COVE OPHIOLITE, NEWFOUNDLAND

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## INTRODUCTION

The Tilt Cove Mine is hosted by the Betts Cove Ophiolite which is located along the eastern edge of the Baie Verte Peninsula (Figure 8.1). The Burlington Peninsula straddles the Baie Verte - Brompton Line (Williams & St. Julien, 1978), a complex suture zone which separates clastic and carbonate sediments of the continental margin to the west from ophiolitic rocks overlain by island arc volcanic rocks to the east.

The Betts Cove Ophiolite is one of several in the area; the Advocate and Point Rousse complexes follow the suture zone, and the Lushs Bight Group outcrops on the Springdale Peninsula to the southeast. The Betts Cove Ophiolite is conformably overlain by the Snooks Arm Group, unconformably overlain by the subaerial Cape St. John Group, and intruded by the Cape Brulé Porphyry. Hibbard (1983) provides a comprehensive description of the geology of the Baie Verte Peninsula.

The Lower Ordovician Betts Cove Ophiolite together with the overlying Snooks Arm Group forms an arcuate belt extending over 15 km between Betts Cove in the southwest and Tilt Cove in the northeast. Upadhyay (1973) was the first to clearly describe and interpret the assemblage in terms of an ophiolite suite conformably overlain by volcanic and sedimentary rocks of presumed island arc affinity. His stratigraphic subdivisions are shown in Figure 8.2.

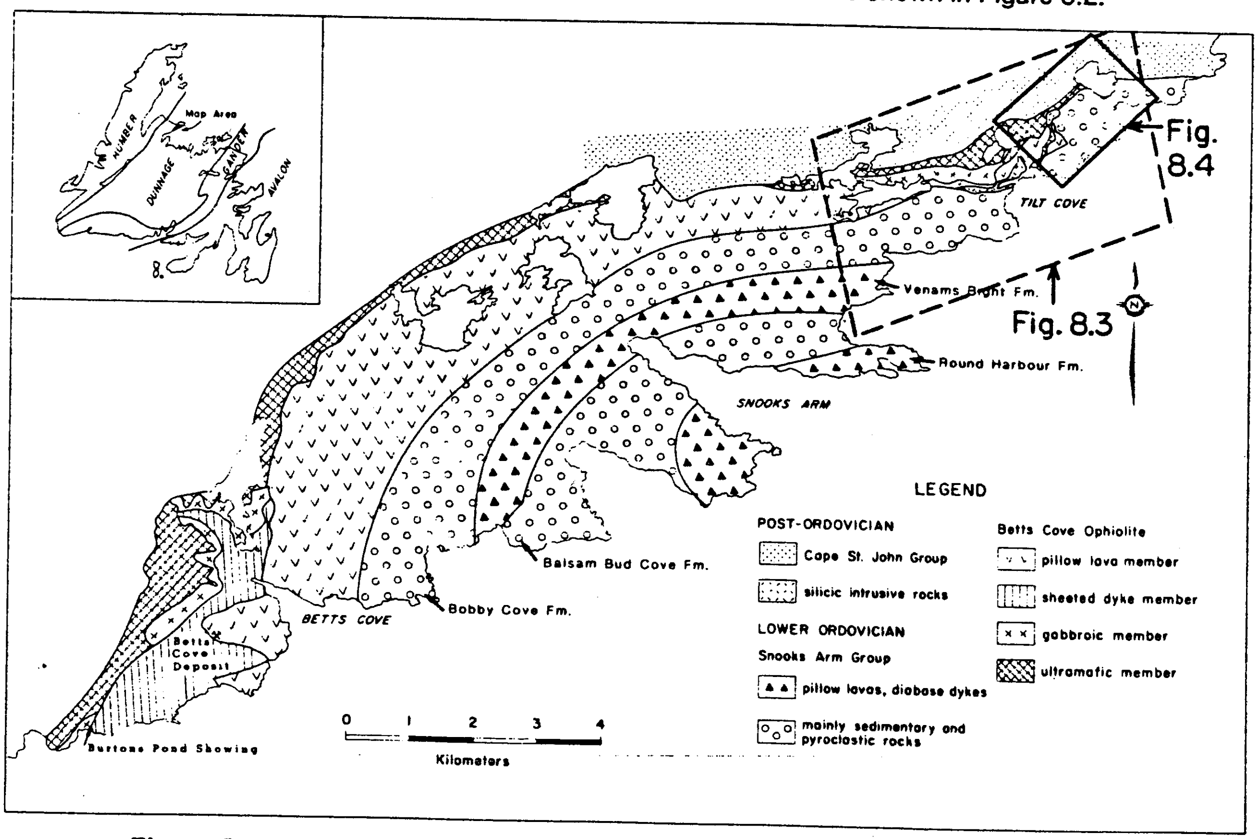



***Figure 8.1*** *Geology of the Betts Cove - Tilt Cove area (after Upadhyay, 1973).*

## BETTS COVE OPHIOLITE

The Betts Cove Ophiolite, as exposed in the Betts Cove area where the sequence is complete, is typical of ophiolites throughout the world. From the base upward it includes ultramafic, gabbroic, sheeted diabase and pillow lava units, all with transitional contacts.

The ultramafic unit, with a maximum thickness of 750 m, is typically layered harzburgite-dunite-pyroxenite with graded and cross-bedded layers dipping about 50° southeast. Ultramafic rocks occur locally as intrusive gas breccia dykes and pegmatitic clinopyroxenite dykes (Upadhyay, 1973). The portion of the ultramafic belt extending from Betts Big Pond to Tilt Cove is largely altered to serpentinite and talc-carbonate-quartz.

The gabbroic rocks, with a maximum thickness of 330 m, have a transitional contact with the underlying ultramafic rocks, but they are faulted out through most of the ophiolite belt. The gabbro ranges from pegmatitic to fine grained, and displays cumulate layers ranging from anorthosite to clinopyroxenite. Toward its top the gabbroic unit is cut by abundant diabase dykes, marking the transitional contact with the overlying sheeted diabase dyke unit.

The sheeted diabase unit is best developed in the Betts Cove area where it reaches a maximum thickness of 1600 m (Upadhyay, 1973). It consists of almost 100% dykes, and locally dyke breccia, with minor ultramafic or gabbroic screens. The trend of the dykes is generally perpendicular to the cumulate layering of the ultramafic and gabbroic screens, and to the strike of the pillow lavas.

The pillow lava member is the most extensive unit of the ophiolite. It outcrops from Betts Cove to Tilt Cove, and varies in thickness from 1500 m to < 50 m along the south shore of Long Pond (Figure 8.3). A 60 m thick argillaceous unit extends through much of the inland portion of the pillow lava unit (Upadhyay, 1973). The pillows are basaltic or, less commonly, ultramafic. They are commonly variolitic and are close-packed with minor interpillow chert. Pillow breccias are common, and in the eastern (Tilt Cove) end of the belt are typically variolitic and contain abundant red chert.

Upadhyay & Neale (1979) subdivided the pillow lava unit in the Betts Cove area into two parts in sharp contact with each other: a lower komatiitic horizon and overlying rocks like typical mid-ocean ridge basalts. Coish *et al.* (1982) subdivided the lavas into three stratigraphic units: upper lavas with a chemical signature like that of normal ocean floor basalts, middle lavas with lower $TiO_2$ content, and lower lavas with anomalously lower $TiO_2$ contents. Mineralization at Betts Cove is associated with the lowest horizon, near the sheeted diabase - pillow lava contact (Upadhyay & Strong, 1973; Strong, 1980, 1984; Saunders & Strong, 1986).

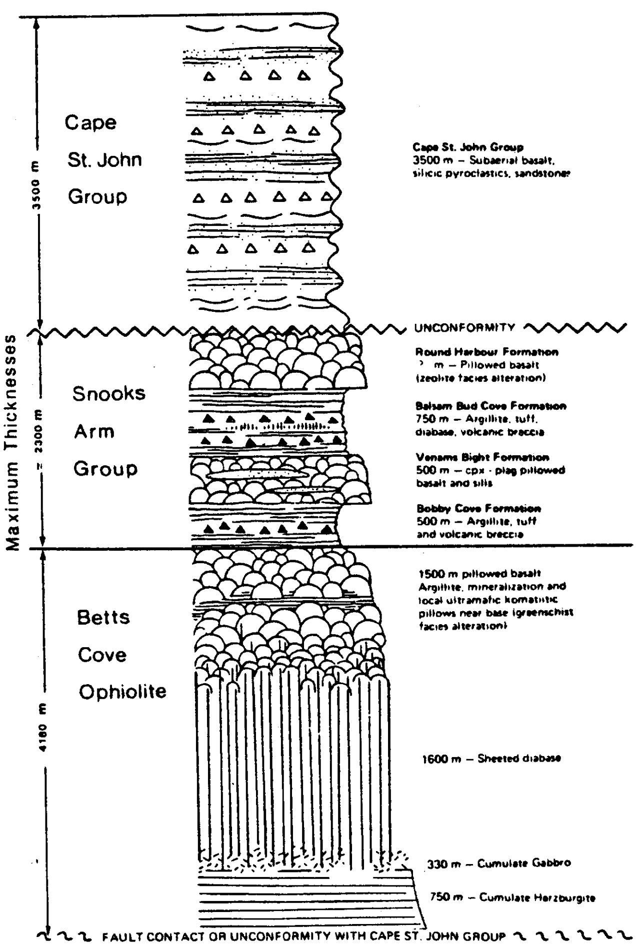



*Figure 8.2 Generalized stratigraphic section for the Betts Cove - Tilt Cove area, showing the maximum thicknesses (*data from *Upadhyay, 1973).*

## SNOOKS ARM GROUP

The ***Bobby Cove Formation,*** overlying the pillow lava unit of the Betts Cove Ophiolite, extends throughout the Snooks Arm Group with an average thickness of about 500 m. It is dominated in the west by pyroxene-andesite agglomerate, tuff and greywacke, with less abundant thinly bedded, variably coloured chert and argillite and minor conglomerate. Thin flows of pillowed basalt occur at several levels in the formation, and diabase sills are very abundant.

The ***Venams Bight Formation*** conformably overlies the Bobby Cove Formation along a contact about 8 km long. It consists of about 500 m of grey-green pillow lava containing some plagioclase and rare clinopyroxene phenocrysts. Diabase sills form 25-40% of the formation, and minor chert and pillow breccia are also present.

The ***Balsam Bud Cove Formation*** is similar to the Bobby Cove Formation, but reaches a thickness of 750 m.

Rocks of the ***Round Harbour Formation*** are like those of the Venams Bight Formation, but they are black rather than grey-green, reflecting their lesser degree of (zeolite facies) alteration than the greenschist alteration of the underlying lavas.

## CAPE ST. JOHN GROUP

The Cape St. John Group is a subaerial sequence about 3500 m thick, of basalts, silicic ash-flow tuffs and sandstones, which unconformably overlies the Snooks Arm Group (DeGrace *et al.*, 1976; Neale *et al.*, 1975). It is dominated by quartz- and feldspar-porphyritic rhyolite tuff and breccia which consist of quartz and K-feldspar phenocrysts in a quartz-feldspar matrix. Intrusive breccias occur as dykes, plugs and diatremes, and contain the same clasts as the pyroclastics. Dykes equivalent to these rocks intrude the Snooks Arm Group, and are especially abundant in the Tilt Cove area.

The base of the Cape St. John Group in the Beaver Cove area consists of coarse grained calcareous sandstone and minor conglomerate, which are repeated throughout the group. The sandstones contain quartz and feldspar fragments, and both the felsic volcanics and the sandstones contain red and green ultramafic and chert clasts.

Basaltic flows and sills occur throughout the Cape St. John Group. They are generally 50 m thick but locally much thicker. They are dark green to purple-grey, aphanitic and generally non-porphyritic, with large calcite-filled vesicles, and local columnar jointing.

## GEOLOGY OF THE TILT COVE AREA

The detailed geology of the Tilt Cove area is shown in Figures 8.3 and 8.4. The following descriptions of rocks in the area are given in order from older to younger, following the sequence shown in Figure 8.3 and based on the work of Strong (1980) and Strong & Saunders (1986).

Ultramafic rocks occupy a belt 750-100 m wide, over a distance of about 6 km. They range from black massive serpentinite — which appears to have been derived from harzburgite — to strongly foliated rusty-weathering yellow talc-carbonate-quartz. On their northwestern boundary, the ultramafic rocks are commonly faulted against or overlain by the Cape St. John

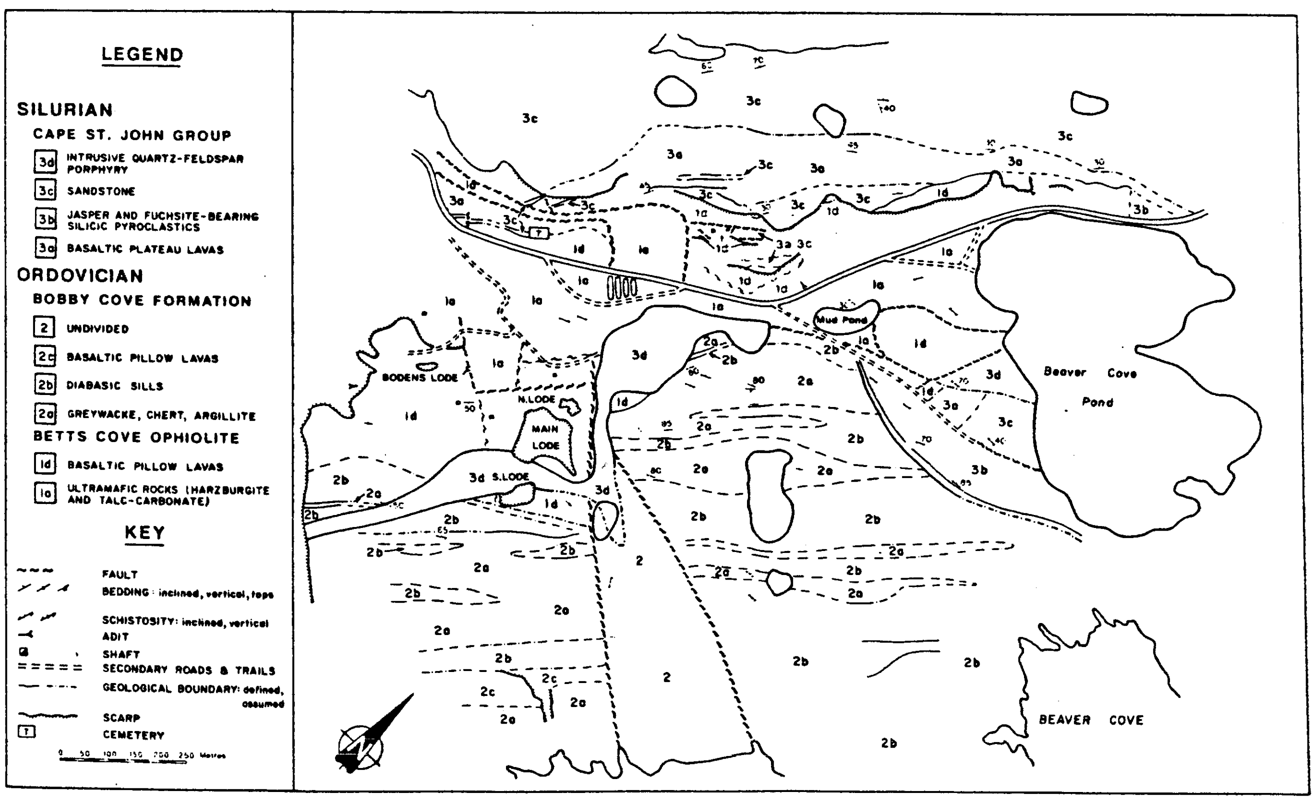



*Figure 8.4 Geological map of the East Mine and surrounding area between Tilt Cove and Beaver Cove Pond* (based on mapping *by Strong, 1980; Strong & Saunders, 1986).*

Group. The contact can be clearly seen as unconformable in the cliffs north of Windsor Lake.

In the area around Long Pond the ultramafic rocks grade southward into gabbro. East of Windsor Lake the southern contact of the ultramafic rocks is not exposed, but it is assumed to be a fault because there is an absence of the gabbroic and sheeted diabase horizons. Furthermore, the contact traverses both the pillow lava unit and the Bobby Cove Formation, and the ultramafic rocks are foliated parallel to the contact.

Gabbro forms a major unit of the ophiolite in the Long Pond area. It ranges from pegmatitic to fine grained, and displays cumulate layers of anorthosite to clinopyroxene oriented parallel to the regional stratigraphy. Toward the top, the gabbro is cut by numerous diabase dykes marking the transitional contact with the overlying sheeted diabase unit.

The sheeted diabase unit occurs on the large island in Long Pond, mapped by Upadhyay (1973) as gabbro. In this area the unit consists of about equal proportions of fine grained nonporphyritic diabase dykes with chilled margins and diabase dyke breccias like those described by Williams & Malpas (1972). Dyke swarms cut pillow lavas on the mainland to the west of these islands, apparently marking the transition to the pillow lava unit.

East of Windsor Lake the pillow lava unit occupies a 400 × 500 m block, bounded by a fault on the northeast and the cliffs of Tilt Cove on the southwest. Its northern contact is a steep scarp which appears to be a fault separating it from the talc-carbonates and serpentinites of the ultramafic unit. Several blocks of pillow lavas also outcrop north of the road where they are in fault contact with the ultramafic unit, and are unconformably overlain by the Cape St. John Group.

The pillows are typically grey-green, variolitic and close-packed with minor interpillow chert. The upper part of the unit contains abundant calcite- and silica-cemented pillow breccia which is locally well bedded and gradational into aquagene tuff. Particularly surrounding the old mine areas, original features such as varioles have been obliterated by mineralization-related alteration resulting in fine grained, rusty-weathering black chloritic rocks.

Two groups of pillow lavas have been separated, based on their geochemical characteristics — primarily Zr and $TiO_2$ contents. A group with extremely low Zr (<8 ppm) is found east of Windsor Lake. Although their differences are critical to the mineralization, the two groups are not distinguishable in the field. They are discussed in more detail in Strong & Saunders *(in press)*.

The overlying Bobby Cove Formation consists of about equal proportions of sedimentary rocks and diabase dykes and sills. The sedimentary rocks are of three main types: coarse green greywackes, fine grained green siltstones, and very fine grained red to chocolate-brown laminated cherts and argillites. These all consist of essentially volcanic components. They are locally gradational but generally occur as distinct units.

The diabase of the Bobby Cove Formation forms both sills and dykes, which in many areas disrupt the sediments indicating their intrusion before lithification. The diabase is typically green-grey and fine grained, although coarse grained varieties and rare plagioclase-phyric types are seen. Contacts are rarely traceable over distance.

The Cape St. John Group is in either unconformable or fault contact with the ophiolitic rocks. The unconformable relation is exposed in the cliffs north of Windsor Lake, and is readily followed northeastward to the shoreline where it was described by Neale *et al.* (1975). The group can be divided into three main interbedded lithological units in the map area: subaerial silicic pyroclastics, epiclastic sandstones, and subaerial basalts.

The sandstones are thin bedded to massive, cross-bedded and typically have a flaggy bedding-plane cleavage. Coyle & Strong (1986) suggested that the sandstones may be base-surge deposits. Beds are up to a metre thick, and dip gently northward near the unconformity but more steeply toward the north. They are consistently fine to medium grained, yellow-green, and contain grey-green clasts of fuchsite derived from the ultramafic rocks of the ophiolite, in a calcareous matrix. A breccia soil zone is locally developed on basalt at the base of coarsely cross-bedded sandstones, and magnetite-rich iron formation is seen close to the base of the group.

The basaltic rocks of the Cape St. John Group are massive, green-purple, fine grained, aphyric to plagiophyric, and highly vesicular. The vesicles are filled with calcite and chlorite, and their concentration and alignment in some areas give a bedding orientation parallel to that of the sandstones.

Coarsely porphyritic grey-green intrusive quartz-feldspar porphyries traverse the stratigraphic sequence from the cliffs west of Tilt Cove northward toward Beaver Cove Pond. The porphyries are best exposed between the two pits of the East Mine, and west of there they show a flow-banded chilled margin where they intrude the pillow breccias. Between the two pits, the porphyry is more altered.

## MINERALIZATION

The main mineralization of the area are the massive pyrite-chalcopyrite-sphalerite (±Au±Ag) deposits in the Betts Cove Ophiolite at Betts Cove and Tilt Cove. The Betts Cove Mine was in operation from 1875 to 1885

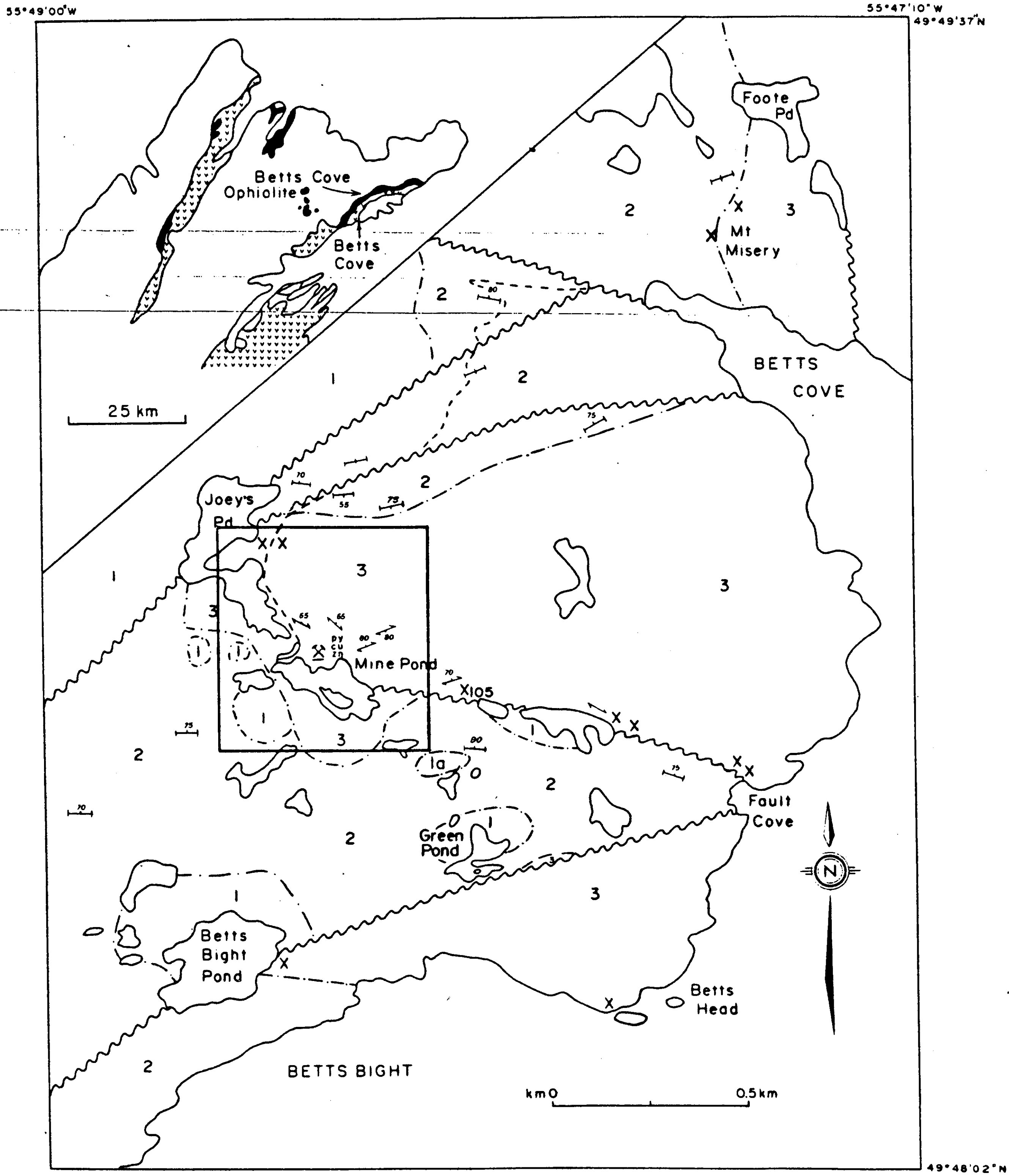



*Figure 8.5 Geology of the Betts Cove area (from Saunders, 1985). (1) gabbro; (1a) plagiogranite; (2) sheeted diabase unit; (3) pillow lava unit; X - sulphide showing; trend of dykes; chloritic shear zone; geological contact; trail. Area in box is shown in more detail in Figure 8.6.*

and produced about 118,000 tonnes of hand-picked ore believed to average about 10% Cu (Snelgrove & Baird, 1953). The mine was closed due to a cave-in and the grade or quantity of any remaining mineralization is not known. Two samples from outcrop and twelve grab samples from dumps on the property yielded variable Cu (0.19-20.02%) and Zn (0.04-20.54%) contents (Saunders & Strong, 1986). Four samples, including one from outcrop, contained Au values >10 g/t; five others contained between 4100 and 9600 ppm Au. Silver contents ranged from 5.3 to 39.5 g/t. Only one sample had significant Pb (1.08%).

The Tilt Cove deposits occur at the opposite end of the ophiolite belt from Betts Cove, about 15 km distance. The Tilt Cove Mine was operated from 1864 to 1917 and was reopened in 1957 for 10 years. About 8 million tonnes of ore were removed over the life of the mine. During the early years of production the grade of the ore was 4-12% Cu; in the 1960s it was only about 2%. About 1,319 kg Au were produced during the later episode of mining (DeGrace *et al.*, 1976).

Upadhyay & Strong (1973) showed that the Betts Cove deposits occur at a stratigraphic position near the sheeted diabase - pillow lava contact. They suggested that a similar stratigraphic control is found at Tilt Cove and other deposits in ophiolites, as would be expected if the ore deposits formed at the spreading centre early in the history of the ophiolite. At Tilt Cove, the West Mine and the Nudulama showing occur right at the base of the pillow lava unit, in contact with the sheeted diabase, but the East Mine orebodies are found just below the contact between the pillow lava unit and the overlying Bobby Cove Formation. The sheeted dyke and gabbro units are faulted out here, and it is not known how much of the pillow lava unit may be missing. All mineralization is accompanied by intense black chloritization as well as more restricted stockwork pyrite and quartz.

The mineralization is mainly pyrite and chalcopyrite, with lesser amounts of sphalerite, as well as traces of galena at the Nudulama showing. Magnetite is common in the ores around Tilt Cove, and is especially abundant along with coarse specular hematite in the East Mine main lode. Magnetite-hematite- bearing cherts are common throughout the volcanic sequence, and are not always associated with sulphide mineralization. These rocks, the Goss Pond sediments of Douglas *et al.* (1940), are associated with both the basalt and sandstones at the base of the Cape

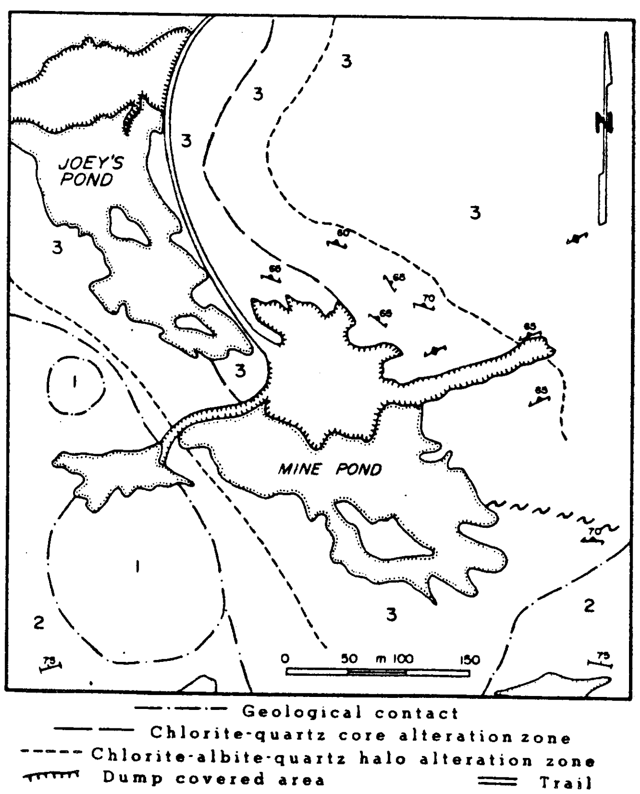



***Figure 8.6*** *Enlargement of mine area from Figure 8.5. Geological units as in Figure 8.5.*

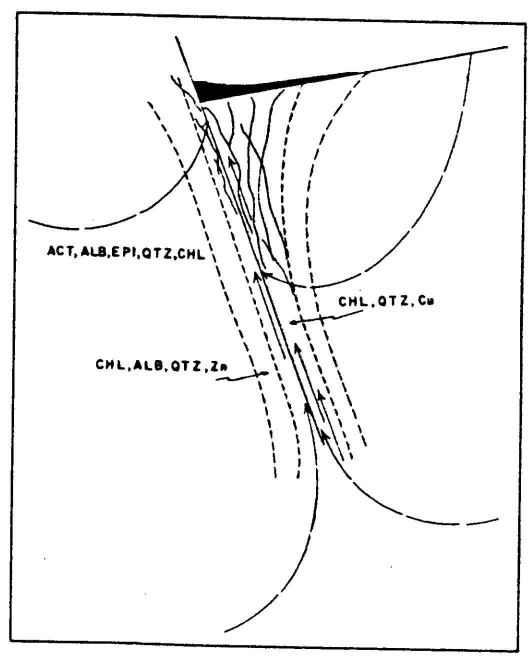



***Figure 8.7*** *Schematic model for formation of the Betts Cove deposit. Mineralizing fluids produced a central stockwork zone characterized by quartz - chlorite alteration surrounded by a zone of quartz - chlorite - albite mineralization; background rocks have an assemblage of actinolite - albite - epidote - quartz - chlorite (from Saunders, 1985).*

St. John Group. Their mode of occurrence at the unconformable contact between the Cape St. John Group and the ophiolite suggests that they resulted from lateritic weathering of the ophiolite. Hurley & Crocket (1985) described gold mineralization which occurs in banded and stringer sulphides within the ophiolitic pillow lavas about 3 m below the iron formation. The gold is associated with sphalerite (as it is at Betts Cove), ranging from 0.569-2.882 g/t Au in massive sphalerite, with one sphalerite separate containing 143.42 g/t Au.

Numerous small pits, shafts and adits are found throughout the area, especially near the East and West Mines, but also at the same horizon on the east end of Long Pond and around the Nudulama showing where there are two shafts about 20 m apart and two adits. These adits were driven on stockwork mineralization in the sheeted diabase horizon, while the main shaft was sunk on more massive ore in the pillow lava - pillow breccia horizon. A peculiar occurrence of massive to disseminated pyrite-chalcopyrite is found near Mud Pond (Figure 8.4) in the schistose talc-carbonate quartz rocks derived from ultramafic rocks. The sulphide minerals exhibit the same tectonic fabrics as the host rocks, indicating their pre-deformation origin.

At Betts Cove (Figures 8.5 and 8.6), alteration zones related to massive sulphide mineralization are superimposed on a background greenschist facies assemblage (Saunders, 1985; Saunders & Strong, 1986). The massive sulphide body is underlain by an alteration pipe consisting of a core chlorite + quartz zone (high-Cu) and a halo chlorite + albite + quartz ± calcite zone (high-Zn) (Figure 8.7). The background greenschist assemblage consists of actinolite + epidote + chlorite + albite + quartz. At Tilt Cove the ophiolitic basalts have been more highly altered, most commonly to chlorite + albite + quartz + calcite. Although at Betts Cove this assemblage occurs in the halo zone of the alteration pipe and can be shown to be related to massive sulphide formation, at Tilt Cove it is not exclusively sulphide-related. Many of the ophiolitic samples with this assemblage, however, do have anomalous Zn values.

A stockwork chlorite + quartz + pyrite assemblage related to mineralization is locally developed, but unlike at Betts Cove there is no sharp mineralogically or geochemically defined alteration pipe, and mineralization-related alteration appears to have occurred more unevenly over a broader area. The large size of this alteration zone may have a direct relationship to the size of the massive sulphide body. At Betts Cove where the alteration pipe is small and localized, the orebody, seems to have been fairly small. At Tilt Cove, however, where alteration occurs over a broad area, almost 8 million tonnes of ore was removed from several separate orebodies. This suggests that a larger convection system was in operation during formation of the Tilt Cove orebodies.

## BV-23: TILT COVE AREA WALKING TOUR

(by C. Saunders, D.F. Strong and T. Al)

The walking tour starts at the dock in Tilt Cove. Stop locations are shown on Figures 9.3 and 9.4.

### *STOP TC-1: BETTS COVE OPHIOLITE - SNOOKS ARM GROUP CONTACT IN CLIFFS ABOVE DOCK*

In the cliffs on north side of the dock, the contact between ophiolitic pillow breccia (Betts Cove Ophiolite) and the overlying Bobby Cove Formation of the Snooks Arm Group is exposed. The Bobby Cove Formation consists of massive diabase sills intruded into red to brown laminated cherts, argillites and siltstones. A dyke of grey-green quartz-feldspar porphyry of the Cape St. John Group can be seen in the cliff face. This dyke cuts the contact between the ophiolitic pillow lavas and the Bobby Cove Formation, passes between the north and south lodes and continues northward across faults which separate the Bobby Cove Formation from the ophiolite.

### *STOP TC-2: PILLOW BRECCIA, BETTS COVE OPHIOLITE*

At the foot of the northeast cliffs opposite the West Mine, ophiolitic pillow breccia can be seen in large angular boulders which form a scree below the cliffs along the dock road. Angular fragments of pillow lava are set in a cherty, calcareous matrix. In places, variolitic quench textures can be seen. Such intense brecciation is typical of the upper levels of the pillow lava unit.

To the west is the large open pit of the West Mine. Traces of the old workings can be seen in the cliff face. Note the black colour of the host pillow lavas, caused by intense mineralization-related chloritization.

*STOP TC-3: DIABASE DYKES, BETTS COVE OPHIOLITE COMPLEX*

Thick irregular diabase dykes and massive diabase which grade into fine-grained gabbro are seen in this large outcrop immediately north of West Mine. Locally, large irregular pods of coarser-grained gabbro are found. Much of the diabase is finely brecciated; fragments are angular but become rounded where brecciation is more intense. Dykes, generally exhibit vague margins, but in places are chilled against gabbro pods. A small patch of parallel thin sheeted dykes are located about halfway up the hill.

The hill provides a good view of the surrounding area, especially of the cliffs opposite the West Mine pit. The intrusive Cape St. John quartz-feldspar porphyry (pink) is clearly outlined against the black chloritized pillow lavas of the West Mine pit.

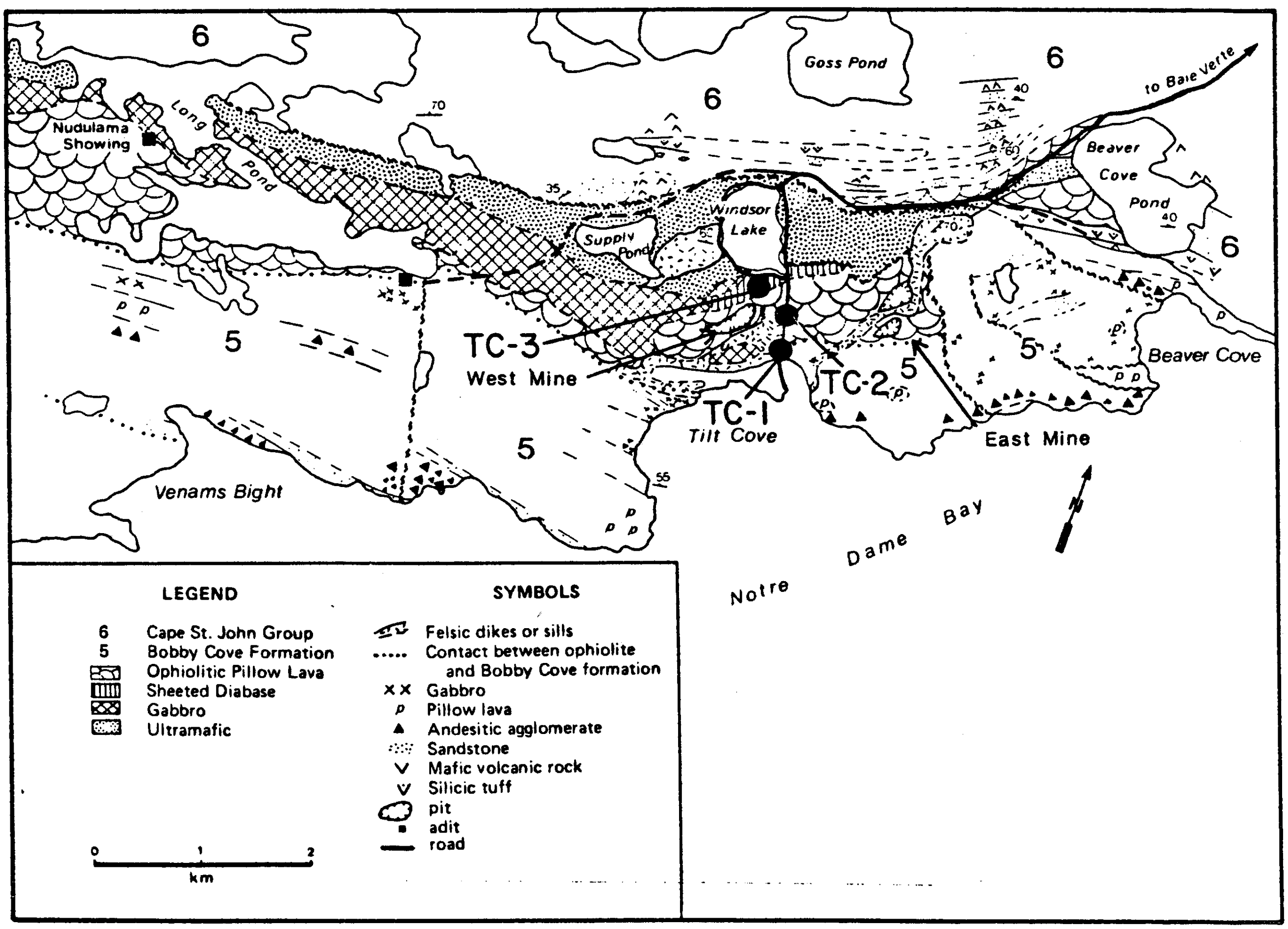
Return to the main road and proceed east up the hill to a point opposite the old mine workings (dump).

*STOP TC-4: PILLOW BASALT, BETTS COVE OPHIOLITE*

This outcrop, on the left (north) side of the road, is composed mainly of pillow lavas which have been intensely chloritized and carbonatized. Some samples are composed of essentially 100% chlorite and original textures have been obliterated. Locally, however, flattened variolitic pillows are preserved, especially near the eastern end of the outcrop and away from the contact with the intensely deformed talc-carbonate schist (altered ultramafic rock). A thin slice of talc-carbonate is in contact with the pillow lavas at the western end of the outcrop.

The pillow lavas are unconformably overlain by the Cape St. John Group which here consists of flat-pebble conglomerates and sandstones interbedded with hematitic, calcareous subaerial basaltic flows.

Cross the road to the plouged-over area and walk towards the old mine.




8.3 and

*Figure 9.3* *Road log stops for the Tilt Cove area (TC-1 to TC-3).*

### *STOP TC-5: EAST MINE, BETTS COVE OPHIOLITE*

**PLEASE BE CAREFUL AROUND THE OLD WORKINGS. DO NOT GO NEAR SHAFTS AND KEEP WELL AWAY FROM THE NORTH LODE.** Walk from the road towards the North Lode and a nearby shaft. The lodes have steep sides which are collapsing and it is extremely dangerous to venture too close.

Massive sulphides cannot be visited in outcrop, but the area northwest of the main workings is strewn with mineralized boulders. Most of these are massive to semi-massive pyrite which commonly exhibits well-preserved colloform textures. Magnetite and specular hematite which replace sulphides are also common.

Walk back (north) across the road and pick up a trail that starts at a garbage dump opposite the old East Mine workings. Follow this trail along the base of the cliffs until you reach an old water-filled shaft sunk on the sulphide breccia horizon.

### *STOP TC-6: TRANSPORTED SULPHIDES*

Although the exposure at this location is not fresh, sulphide breccia fragments varying from several centimeters to 20-25 centimeters in diameter may be discerned. These clasts occur in a chlorite schist matrix which is itself formed of mafic volcanic breccia fragments. A dismembered, but probably stratigraphically equivalent, unit of transported massive sulphide breccia occurs on the north side of the road between Beaver Cove Pond and the old smelter site. The unit occurs in at least three separate exposures in the cliff, or just below the cliff overlooking the road. The best exposure is the one furthest northeast as it has been freshly blasted (a wet day provides the best view of textures). The most easily accessable exposure is the one furthest southwest.

The three exposures show a variety of clast types which might be derived from a typical ophiolite type sulphide deposit. The most abundant clast type appears to be mafic volcanic material (about 50%) while massive sulphide and cherty sulphide clasts combine to form the remainder. Sulphide clasts show some primary (?) banded textures and some sulphides may be seen to follow fractures possibly as a result of compaction or remobilization due to deformation mechanisms.

These sulphide prospects are of considerable interest at present since they contain significant quantities of gold. This high gold content is unusual since the main Tilt Cove ore bodies are thought to have had gold contents of a more typical massive sulphide range. The Betts Cove ore has been shown to contain gold at

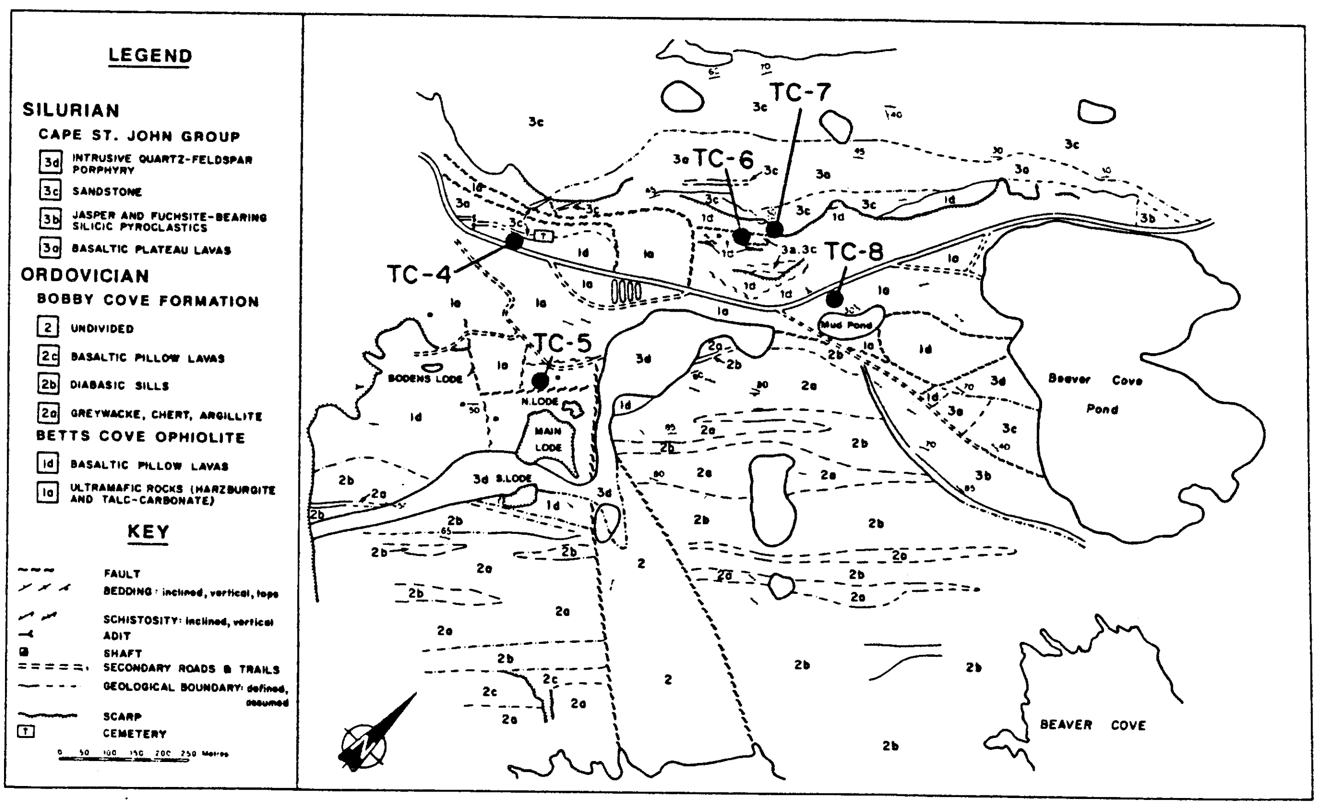



*Figure 9.4 Road log stops for the Beaver Cove Pond - Tilt Cove area (TC-4 to TC-8).*

quantities greater than 10 ppm (Saunders, 1985) so a primary source for the gold is quite reasonable.

***STOP TC-7:*** *IRON FORMATION*

Proceed a short distance along the same trail to where a shaft is driven into massive iron formation which occurs at the base of the Cape St. John Group. The iron formation is composed of magnetite and hematite set in a quartz gangue. It passes conformably upwards into sandstone. The iron formation may be the result of lateritic weathering of the ophiolite. Unlike the underlying ophiolitic sulphide mineralization it does not contain significant gold values.

Return to the main road.

***STOP TC-8:*** *TALC-CARBONATE SCHIST*

Stop at Mud Pond as the hill starts its decline towards Beaver Cove Pond. The area around Mud Pond is underlain by talc-carbonate quartz schist derived from ultramafic rocks. Minor stringer pyrite-chalcopyrite mineralization is found in places. The sulphides exhibit the same tectonic fabrics as the talc-carbonate, indicating their pre-deformation origin.

## 1989 GAC Annual Fall Field Trip

### Noranda/Impala Stog 'er Tight Gold Deposit

The Stog 'er Tight gold deposit is located 8km northeast of Baie Verte in northwestern Newfoundland, on a block of 28 claims optioned in 1986 from Pearce Bradley, of Baie Verte. It is presently a 50/50 Joint Venture between Noranda Exploration, which is the project operator, and International Impala Resources. The property is underlain predominantly by mafic volcanics and associated sediments of the Cambro-Ordovician Point Rousse Ophiolite Complex.

No mineral occurrences were known on the property until 1987, when prospecting discovered gold mineralization in an unmapped gabbro (Gabbro Zone). Recognition of this new style of mineralization focused exploration efforts and led to the July, 1988 discovery by trenching of a much larger zone of similar mineralization, the Stog 'er Tight Zone.

The mineralization consists of bright pink (hematite stained) strongly albitized gabbro with up to 10% coarse-grained pyrite. Fine-grained (<.05mm) native gold occurs as microveinlets and disseminated blebs within the pyrite. The zone strikes 120°, dips moderately north and was systematically trenched over a 450m continuous strike length. The only visible gold observed occurs as very delicate flakes in the voids from which pyrite has weathered out on surface. Channel samples up to 23.0 g/t Au over 7.0m and grab samples up to 115.3 g/t Au were returned.

The mineralization is structurally controlled, being associated with moderately north-dipping reverse faults, which mark the lower contact of the host gabbro with underlying basalts. Locally, pyrite gives way to magnetite on the fringes of the albitized zone, which provides a coincident magnetic response over parts of the zone.

The Gabbro Zone will serve as the main field trip stop on this property because it is easily accessed and is exposed over a large area. The mineralization strikes 120°, dips north and has an apparent thickness of 10m on surface. Within the mineralized zone one metre wide lenses of high grade (>30 g/t Au) mineralization occur.

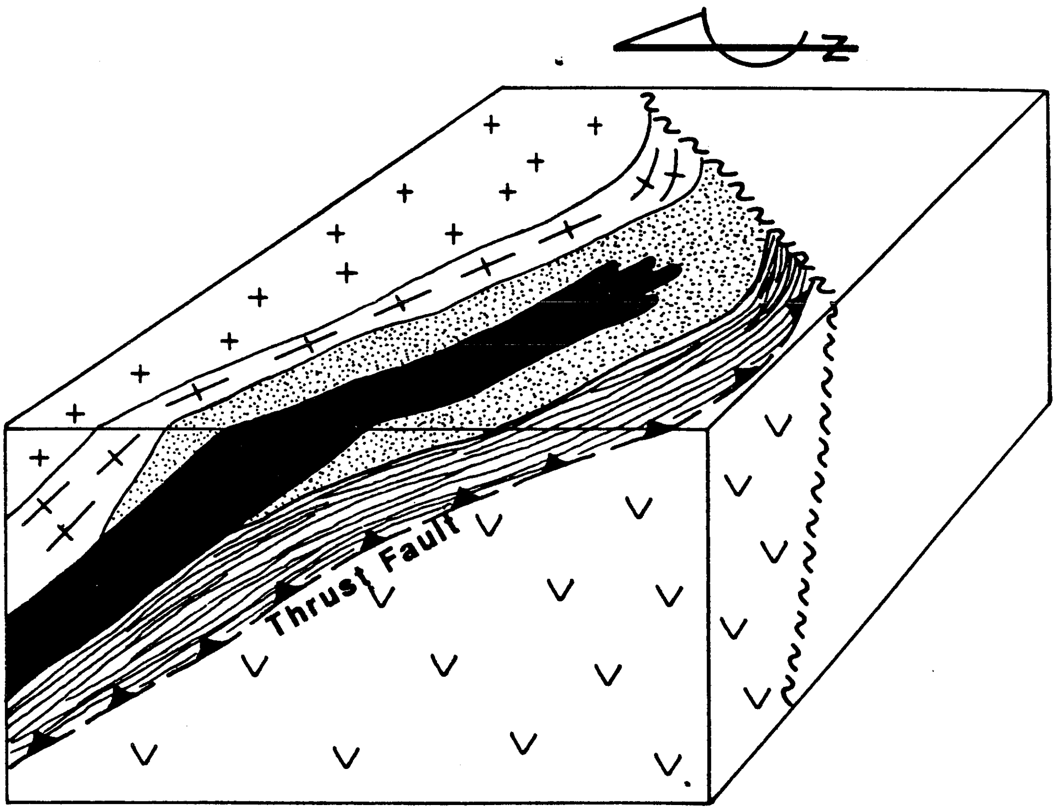
Towards the north (hangingwall), the mineralized zone (characterized by pyrite) is in sharp contact with albitized gabbro with magnetite, which does not contain elevated gold concentrations. Beyond this is a moderately sheared, relatively unaltered gabbro with coarse (primary ?) magnetite, followed by massive coarse-grained gabbro. Towards the south (footwall) is another sharp contact with magnetite bearing, albitized gabbro. Diamond drilling indicates that this is underlain by a zone of intense deformation 5m thick, which hosts abundant bull quartz veins and separates it from barren mafic volcanics. This fault zone and its attendant veining do not contain elevated gold concentrations. It is inferred to outcrop in the low ground immediately south of the zone.

Towards the east, the zone is in sharp interdigitating contact with albitized, magnetite bearing gabbro. These contacts are inferred to represent the limits to which the mineralizing fluids migrated rather than a structurally induced pattern. Further east, the cleavage rotates to the northeast into an inferred northwest trending fault.

A brief visit to the nearby "Main Zone" will be made if time permits. This zone consists of small high-grade quartz-pyrite veins hosted by carbonate altered mafic volcanics. The zone displays deformation features more clearly than the Gabbro Zone, namely a 120° cleavage, subhorizontal fold axes and ubiquitous down-dip lineations, features indicative of horizontally-directed compression.

# GABBRO ZONE

## SCHEMATIC BLOCK DIAGRAM




Massive, coarse-grained gabbro.

Sheared gabbro with magnetite.

Albitized gabbro with magnetite.

MINERALIZED ZONE;
Albitized gabbro with pyrite.

Intensely sheared gabbro.

Basalt

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|---|---|
| Project: STOG 'ER TIGHT | Date: OCT 89 |
| NTS: 12H/16 | Geologist: A.HUARD |

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